REMARKS

Claims 1-12 are pending in the application.

35 U.S.C. § 103 REJECTIONS

In the present Office Action, claims 1-12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over newly cited references U.S. Patent No. 5,020,049 (hereinafter "Bodeep") in view of U.S. Patent No. 5,351,148 (hereinafter "Maeda"). Applicant respectfully traverses these rejections and requests reconsideration in view of the following discussion.

In paragraph 3 of the present Office Action, it is stated:

> "Bodeep differs from the claimed invention in that Bodeep fails to specifically teach for each low-speed channel, estimating an attenuation caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel. However, Bodeep suggests estimating the attenuation for each low-speed channel caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel (Figure 2, 5-11). Furthermore, Maeda, in the same field of frequency division multiplexed optical systems, teaches for each low-speed channel, estimating the attenuation for each low-speed channel caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel (Figure 1-3 and 5). One skilled in the art would have been motivated to estimate the attenuation of the communications system for each of the low-speed channels in order to individually compensate for the estimated attenuation of the communications system via adjustment of the power of each low-speed channel."

Applicant agrees that Bodeep fails to teach for each low-speed channel, estimating an attenuation caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel. However, Applicant does not agree that Bodeep's Figures 2 and 5-11 suggest

such features. It is first noted that Claim 1 recites a method for compensating for dispersion effects **in the optical fiber**. In contrast, Bodeep is directed to minimizing the second-order distortion generated within the transmitting laser diode. Figure 2 depicts such second-order distortion as a function of frequency. However, second-order distortion and attenuation caused by dispersion are completely different physical phenomena originating in different parts of the communications system and may not be related or vary with frequency in similar ways. The remaining cited figures do not involve any channel dependencies at all. Figure 5 depicts the rate of change of voltage with current as compared to the rate of change of light output power with current. Figures 6-11 depict various operating parameters of a laser diode as a function of drive current. None of these figures suggest estimating or compensating for attenuation caused by dispersion in the frequency band allocated to each channel, as recited. Applicant has carefully examined the remainder of the reference and does not find any mention of dispersion effects or methods of compensating for them.

Further, Applicant submits that Figures 1-3 and 5 of Maeda also do not teach or suggest for each low-speed channel, estimating the attenuation for each low-speed channel caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel as recited. In contrast to the present invention, Maeda is directed to a method of setting the modulation level of signals in a frequency division multiplexed system to minimize an error rate caused within the transmitting laser, rather than in the fiber medium through which the signals are transmitted. In particular, Figure 1 of Maeda depicts an error rate as a function of modulation level; Figure 2 depicts a signal spectrum for one channel; Figure 3 depicts noise surges versus time for one 16-QAM channel; and Figure 5 depicts various theoretical and measured error rates as a function of modulation level. None of these figures suggest estimating or compensating for attenuation caused by dispersion in the frequency band allocated to each channel, as recited. Applicant finds no teaching or suggestion in Maeda of "for each low-speed channel, estimating attenuation caused by dispersion resulting from transmission of the low-speed channel **across the optical fiber** in the frequency band allocated to the low-speed channel," as is recited in claim 1. Since

neither Maeda nor Bodeep teach or suggest these features, Applicant submits all the features of claim 1 are not disclosed or suggested by the cited references, either singly or in combination, and a prima facie case of obviousness has not been established.

For at least these reasons, Applicant submits that claim 1 is patentably distinguishable from the cited art. As independent claim 7 includes features similar to those of claim 1, claim 7 is believed patentably distinguishable from the cited art for similar reasons. Likewise, each of dependent claims 2-6 and 8-12 are believed patentably distinguishable from the cited art for at least the above reasons as well.

In addition to the above, in paragraph 3 of the present Office Action, it is suggested that:

> "Bodeep teaches an optical fiber communication system including an optical fiber, a method for compensating for dispersion effects in the optical fiber, the method comprising: receiving at least two low-speed channels (reference numerals 12-14 in Figure 1), each low-speed channel allocated a different frequency band of an optical fiber communications system for transmission across the communications system (column 3 lines 59-62); adjusting a power of each low-speed channel to compensate for attenuation caused by dispersion (column 4 lines 23-25); and frequency division multiplexing (reference numeral 15 in Figure 1) the power-adjusted low-speed channels to produce an electrical high-speed channel for transmission across the communications system."

However, Applicant submits that the cited art does not disclose or suggest all of these features as recited in claim 1. For example, claim 1 recites a method that includes:

> "for each low-speed channel, estimating attenuation caused by dispersion resulting from transmission of the low-speed channel across the optical fiber in the frequency band allocated to the low-speed channel;
>
> adjusting a power of each low-speed channel to compensate **for the estimated attenuation** caused by dispersion;"

It is noted that attenuation caused by dispersion is estimated for each channel and that a power of each channel is adjusted to compensate for the estimated attenuation. The adjusting performed on a particular channel is to compensate for the attenuation that was estimated for that particular channel. In contrast to the above highlighted features, Bodeep merely discloses a frequency division multiplexed system in which the total amount of radio frequency power used to modulate an optical transmitter may be varied in order to reduce signal distortion. More specifically, Bodeep discloses:

> "FIGS. 10 and 11, respectively, present an output light power L versus total laser drive current I characteristic curve 72 and its light power derivative dL/dI curve 75. These curves 72 and 75 represent the performance of the laser diode 40 of FIG. 3 for a slow turn-on device. It is noted that the light power derivative curve 75 of FIG. 11 has a broad peak region. When the point at the maximum value of the derivative curve 75 of FIG. 11 is determined, the corresponding drive current I.sub.op is used for determining an operating point 76 for the device 40 on the curve 72. It is a special case for the multi-channel television multiplexing arrangement of FIG. 1. When the slow turn-on laser diode, characterized by the curves 72 and 75, is operated at operating point current I.sub.op, a tangent to the derivative curve 75 at the operating point current I.sub.op is a horizontal line 77. This represents the maximum of the light power derivative and is at a point of inflection in light power curve 72. Second-order distortion is very small at this operating point since the slope of the derivative curve 75 is zero. Operating at the point 76 is advantageous when a very low leakage current device is not available. For lasers with otherwise unacceptable leakage current levels, the superlinearity of the slow turn-on cancels the sublinearity caused by current leakage and results in distortions within the target specifications.
>
> Lasers have been selected for a multi-channel amplitude-modulated vestigial-sideband CATV system based upon the linearity criteria just described. However, when those lasers are installed in the multi-channel multiplexing system, the operating bias current I.sub.f is selected based upon both the carrier-to-noise ratio and the distortion products. For example, in any given channel the carrier-to-noise ratio is set to the desired value (e.g., in a loop transmission system, a carrier-to-noise ratio of approximately 48 dB and a composite second-order and a composite triple beat of approximately 57 dBc are used; for a trunk transmission system, carrier-to-noise ratios of approximately 50-51 dB, a composite second order of approximately 55-60 dBc, and a composite triple beat of approximately 60-65 dBc are used) by increasing the modulation depth and then optimizing the laser drive current to minimize the distortion

> products. The optimized laser drive current I.sub.f for best system operation generally is within several milliamps of the device drive current I.sub.op discussed hereinbefore in regard to the device selection process." (Bodeep, column 8 lines 3-49).

As may be seen from the above, Bodeep teaches optimizing the drive current of a laser diode to minimize distortion. However, this teaching refers to controlling the overall modulation level of all channel frequencies collectively, rather than to the relative modulation level between channels. It is further noted that Bodeep's system is directed to minimizing distortion rather than to compensating for attenuation caused by dispersion, as recited. Applicant has carefully examined the reference and does not find any mention of dispersion effects or methods of compensating for them. Accordingly, Applicant submits that Bodeep does not teach or suggest "adjusting a power of each low-speed channel to compensate for the estimated attenuation caused by dispersion," as is recited in claim 1. Nor are these features found in Maeda. For at least these additional reasons, Applicant submits that claim 1 is patentably distinguishable from the cited art, either singly or in combination. As independent claim 7 includes limitations similar to those of claim 1, claim 7 is believed patentably distinguishable from the cited art for similar reasons.

In addition to the above, Applicant submits the dependent claims recite additional features which are neither taught nor suggested by the cited art. For example, Applicant submits that claims 2 and 8 recite limitations neither taught nor suggested by the cited art. On page 3, paragraph 2 of the present Office Action, the examiner states:

> "both Bodeep and Maeda that the step of adjusting a power of each low-speed channel comprises applying a gain to each low-speed channel which is equal in magnitude to the estimated attenuation for that low-speed channel (reference numeral 724 in Figure 1 of Maeda; column 4 lines 23-25 of Bodeep)."

Applicant has already discussed above that the cited art does not disclose "for each low-speed channel, **estimating attenuation caused by dispersion** resulting from transmission of the low-speed channel across the optical fiber in the frequency band

allocated to the low-speed channel." The cited art differs in additional ways from the claimed invention. For instance, while Maeda discloses an individual gain adjustment for each 16-QAM channel, Maeda does not disclose or in any way suggest a gain adjustment that "is equal in magnitude to the estimated attenuation for that low-speed channel," as recited. Nor does Bodeep disclose this feature. The cited portion of Bodeep merely says, "Generally, the distortion can always be reduced by reducing the optical modulation depth (m) or the amount of radio frequency power into the laser." Bodeep also does not suggest adjusting individual channels or making an adjustment that "is equal in magnitude to the estimated attenuation for that low-speed channel," as recited. Accordingly, Applicant submits that claims 2 and 8 are patentably distinguishable from the cited art for at least these additional reasons as well. Likewise, each of dependent claims 3 and 9 is believed patentably distinguishable from the cited art for at least the above reasons as well.

In addition to the above, Applicant submits that claims 5, 6, 11, and 12 recite further limitations neither taught nor suggested by the cited art. Claim 5 recites estimating an attenuation caused by chromatic dispersion. Claim 6 recites estimating an attenuation caused by polarization mode dispersion. These features are found nowhere in either Bodeep or Maeda. For at least these additional reasons, Applicant submits that claims 5 and 6 are patentably distinguishable from the cited art. As claims 11 and 12 recite features similar to those of claims 5 and 6, claims 11 and 12 are believed patentably distinguishable from the cited art for similar reasons.

Applicant believes all claims to be in condition for allowance. Should the examiner believe issues remain which would prevent the application from proceeding to allowance, the below signed representative request a telephone interview (512) 853-8866 in order to facilitate a speedy resolution.

CONCLUSION

Applicant submits the application is in condition for allowance, and an early notice to that effect is requested.

If any fees are due, the Commissioner is authorized to charge said fees to Meyertons, Hood, Kivlin, Kowert, & Goetzel, P.C. Deposit Account No. 501505/5957-41409/RDR.

Respectfully submitted,

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